CLAIMS

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1. A lithographic projection apparatus comprising:

an illumination system for supplying a projection beam of radiation;

a first object table for holding patterning means capable of patterning the projection beam according to a desired pattern;

a second object table for holding a substrate;

a projection system for imaging the patterned beam onto a target portion of the substrate; and

a reference frame; characterized by:

a position detection device comprising:

a radiation source mounted on said reference frame;

a two-dimensional radiation detector mounted in a fixed position on said reference frame; and

a mirroring device mounted on one of said object tables that is moveable relative to said reference frame so as to reflect radiation emitted by said radiation source toward said radiation detector.

2. Apparatus according to claim 1 wherein said radiation source is a source of collimated radiation.

3. Apparatus according to claim 1 or 2 wherein said radiation source is a source of monochromatic radiation.

4. Apparatus according to claim 1, 2 or 3 wherein said mirroring device is a retro-reflector.

5. Apparatus according to any one of the preceding claims wherein said radiation source comprises a light source mountable away from the reference frame, beam directing optics mountable on said reference frame and an optical fiber to couple said light source to said beam directing optics.

6. Apparatus according to any one of the preceding claims wherein said radiation source comprises a laser diode, or an LED as a light source.

7. Apparatus according to any one of the preceding claims wherein said two-dimensional position detector is a two-dimensional PSD, or a CCD camera, or a four quadrant photo-detector.

8. Apparatus according to any one of the preceding claims wherein said retro-reflector comprises a trapezoid form of a material transparent to said radiation and having three mutually perpendicular surfaces meeting at a corner, said three surfaces being provided with a reflective coating.

9. Apparatus according to any one of claims 1 to 7 wherein said retro-reflector comprises a convergent lens and a reflective surface, said reflective surface being spaced a distance from said lens equal to the focal length of said lens.

10. Apparatus according to any one of the preceding claims comprising three position detection devices as therein defined.

11. Apparatus according to any one of the preceding claims further comprising an incremental position sensing device for detecting the position of said moveable object table in a detection range wider than that of said position detection device and means for combining output signals from said incremental position sensing device and said position detector to determine an absolute position of said object table in said detection range.

12. A method of manufacturing a device using a lithographic projection apparatus comprising:

an illumination system for supplying a projection beam of radiation;

a first object table for holding patterning means capable of patterning the projection beam according to a desired pattern;

a second object table for holding a substrate;

a reference frame; and

a projection system for imaging the patterned beam onto a target portion of the substrate; the method comprising the steps of:

providing a substrate provided with a radiation-sensitive layer to said second object table;

providing a projection beam of radiation using the illumination system;

using said patterning means to endow the projection beam with a pattern in its cross section; and

projecting the patterned beam onto said target portions of said substrate;

characterized in that:

prior to or during said step of projecting, one of said object tables that is moveable relative to said reference frame is determined to be in a reference position by the steps of emitting radiation from a radiation source mounted on said reference frame toward a mirroring device mounted on said one object table, reflecting the radiation by said mirroring device and detecting the reflected radiation in a two-dimensional radiation detector mounted in a fixed position on said reference frame.

13. A method according to claim 12, wherein said lithographic projection apparatus further comprises an incremental position sensing system for sensing the position of said one object table, said method comprising the further step, after said one object table is determined to be in said reference position, of determining the absolute position of said one object table by measuring movements thereof relative to said reference position using said incremental position sensing system.

14. A device manufactured according to the method of claim 12 or 13.

15. A position detection device comprising:

a radiation source mounted on a reference frame;

a two-dimensional radiation detector mounted in a fixed position on said reference frame; and

a mirroring device mounted on an object that is moveable relative to said reference frame so as to reflect radiation emitted by said radiation source toward said radiation detector.

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